

Evaluation of the MXQ mechanism by using vic and rat

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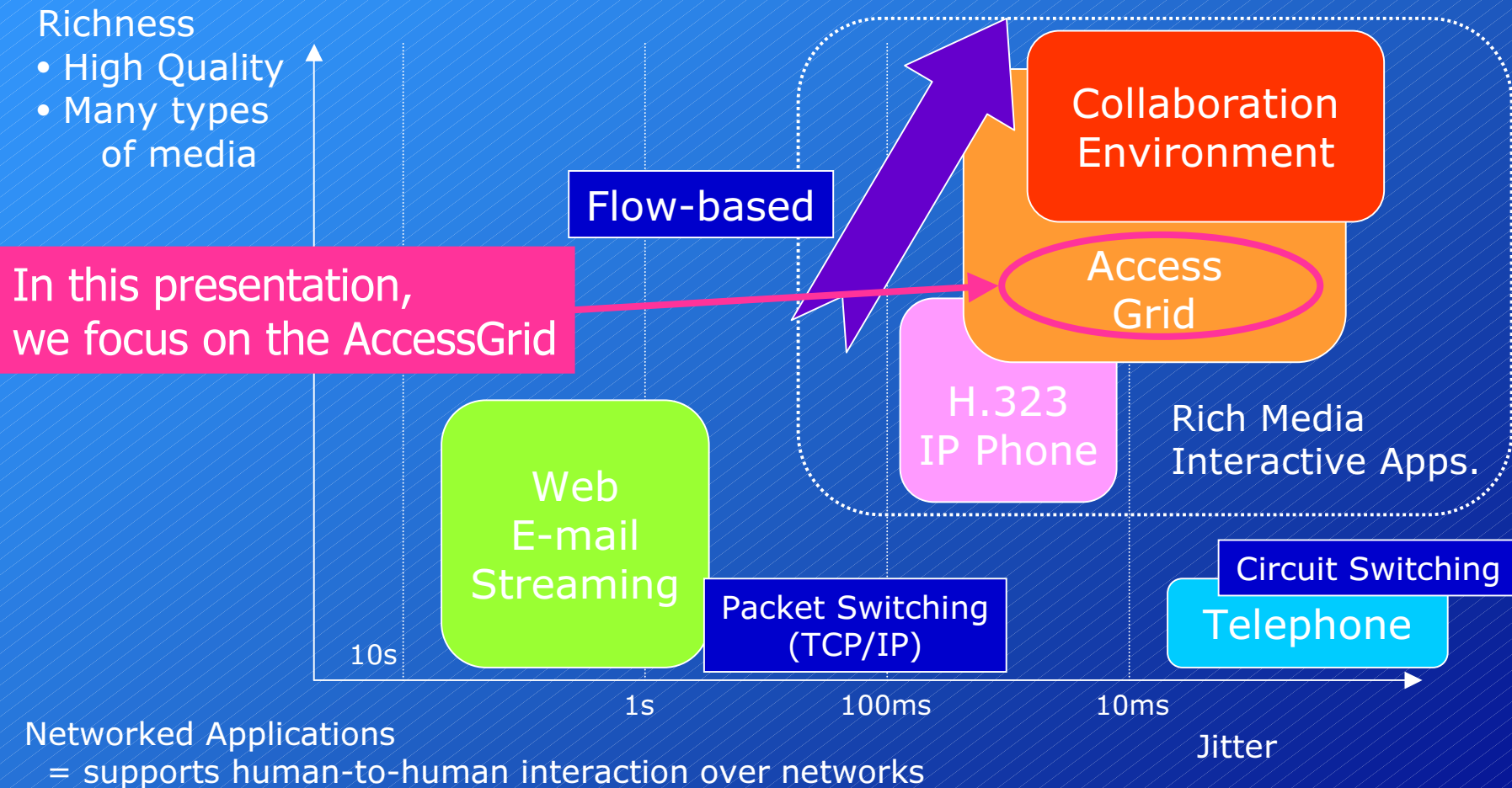
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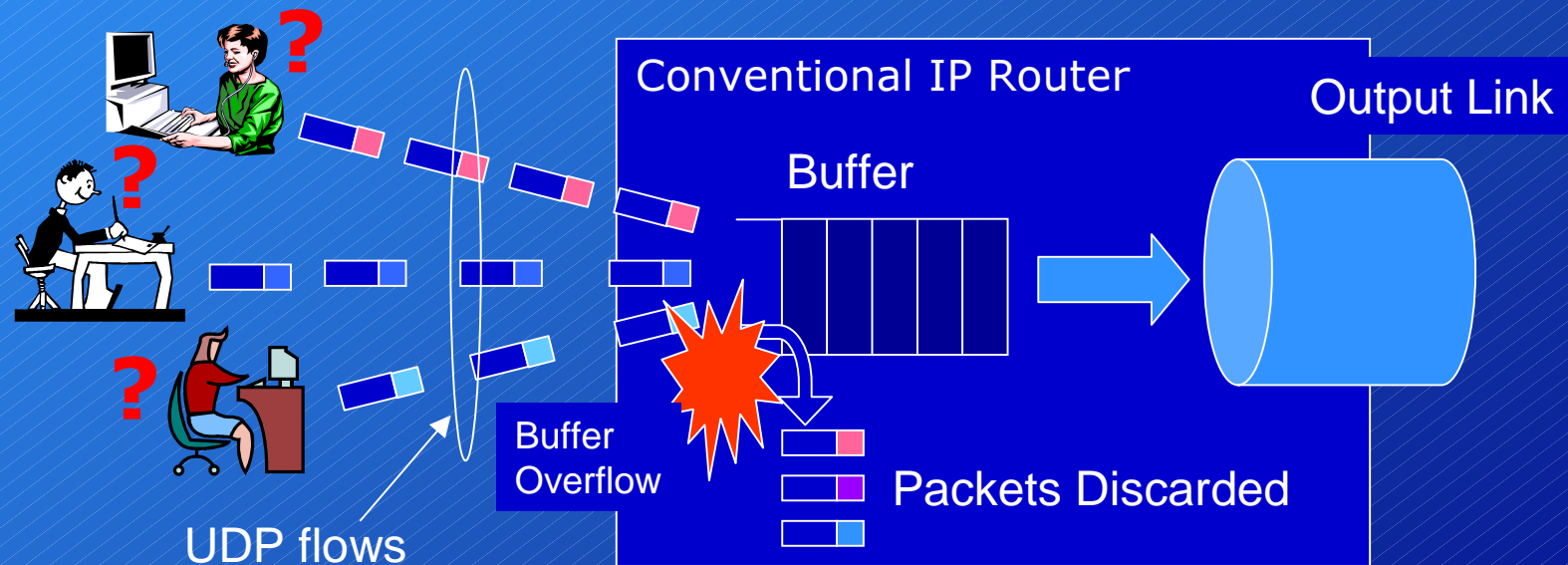
***Seikei University

Evolution of networked applications



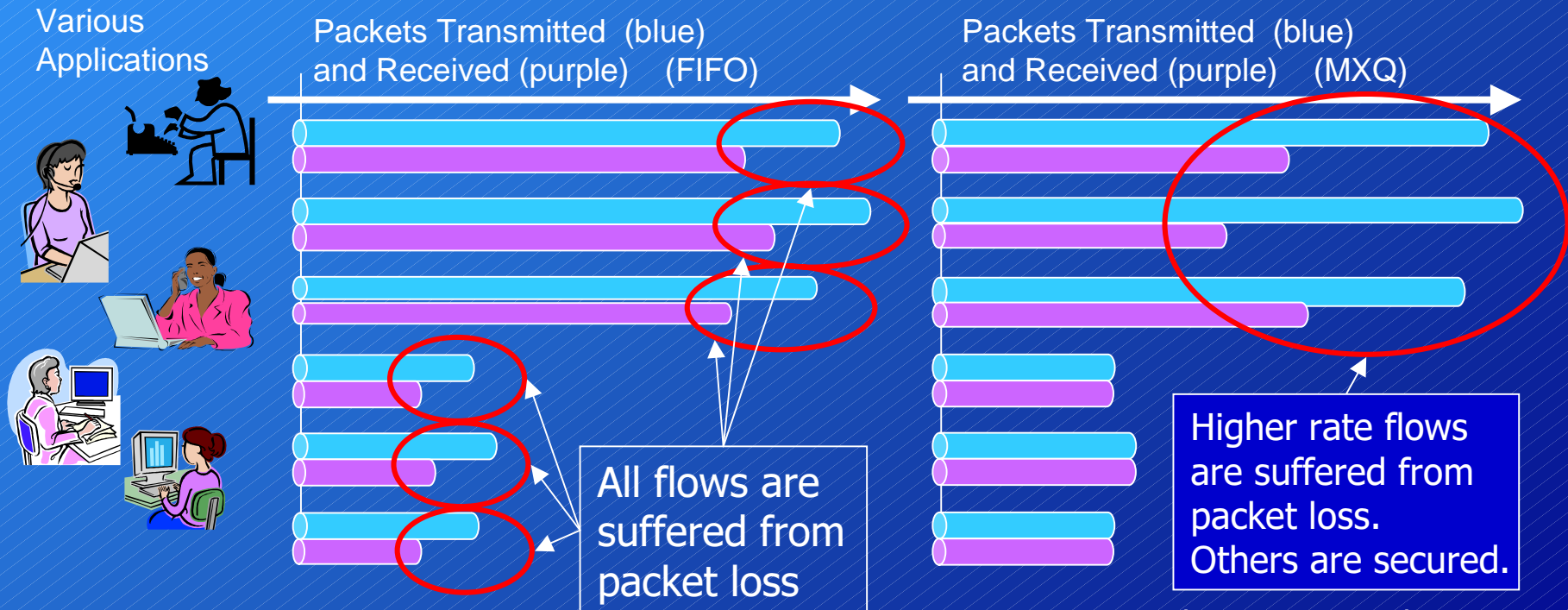
Congestion caused by UDP flows

- All flows (users) suffer from Congestion
 - Packets are tail-dropped (flow-unaware)
- Congestion never recover autonomously.
 - No standard congestion control



MXQ (MaXimal Queuing)

- MXQ is a flow-based traffic control mechanism
 - Achieves dynamic arbitration of flows
 - Estimates the rate of flows, and gives “lower priority” to “higher rate flows” .
 - Secures smaller rate flows during congestion.
 - Gives implicit indications to higher rate flows.



Characteristic of video conferencing applications like AccessGrid

- UDP Audio Flows
 - Mandatory to continue sessions and communications
 - Smaller Rate, Constant

- UDP Video Flows
 - Secondary in priority
 - Video stops or corrupts under congestion but you can see something anyway
 - Higher Rate, Bursty

Benefit to AccessGrid

- What MXQ can provide during congestion are:
 - Protecting Audio Flows
 - Arbitrating Video Flows depending on their sending rate
 - Improving stability of sessions
 - Avoiding significant degradation of quality
- Using MXQ,
 - Packet loss means the indication that the current rate is higher than others'.
 - Reducing the rate can avoid packet loss even though congestion still continues.

Prototype MXQ implementation on commercially-available-router

- We implemented prototype MXQ mechanism on a router
- Supports up to
 - 10Gb/s POS
 - OC-192, OC-48, GigE
 - 6,000,000 flows
- On Egress Card
 - Rate Estimation
 - Selective Packet Discard
- Advanced Technique
 - Rate Estimation at 10 Gb/s Rate
 - Average Rate Calculation among millions of flows

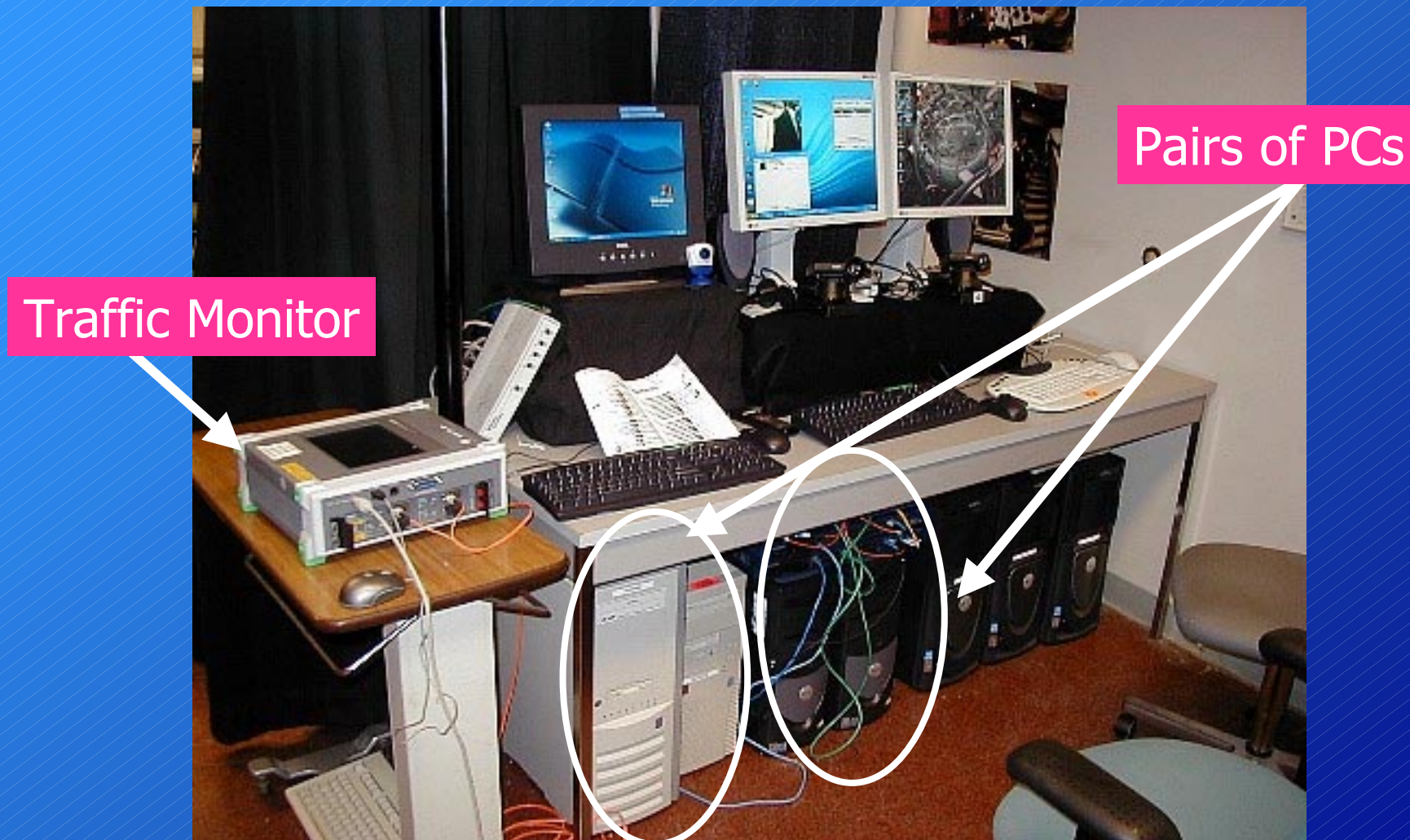


Apeiro
Caspian Networks Inc.

Overview of our experiment

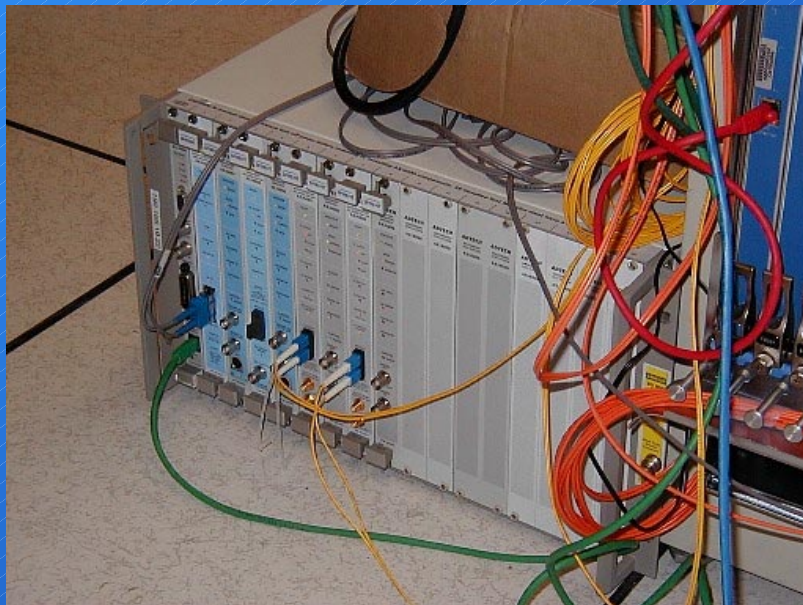
- Goal
 - To evaluate MXQ mechanism
 - Protecting smaller audio flows
 - Protecting increase of latencies of audio flows
 - Arbitrating Video Flows depending on their sending rate
- Approach
 - Connect two pairs of AG nodes with point to point unicast
 - Using the prototype MXQ implementation
 - Using Background Traffic Generator to make a congestion
 - Capture traffic by using “Application Traffic Monitor”
- Location and Support
 - Electronic Visualization Laboratory at University of Illinois at Chicago

PCs and Traffic Monitor

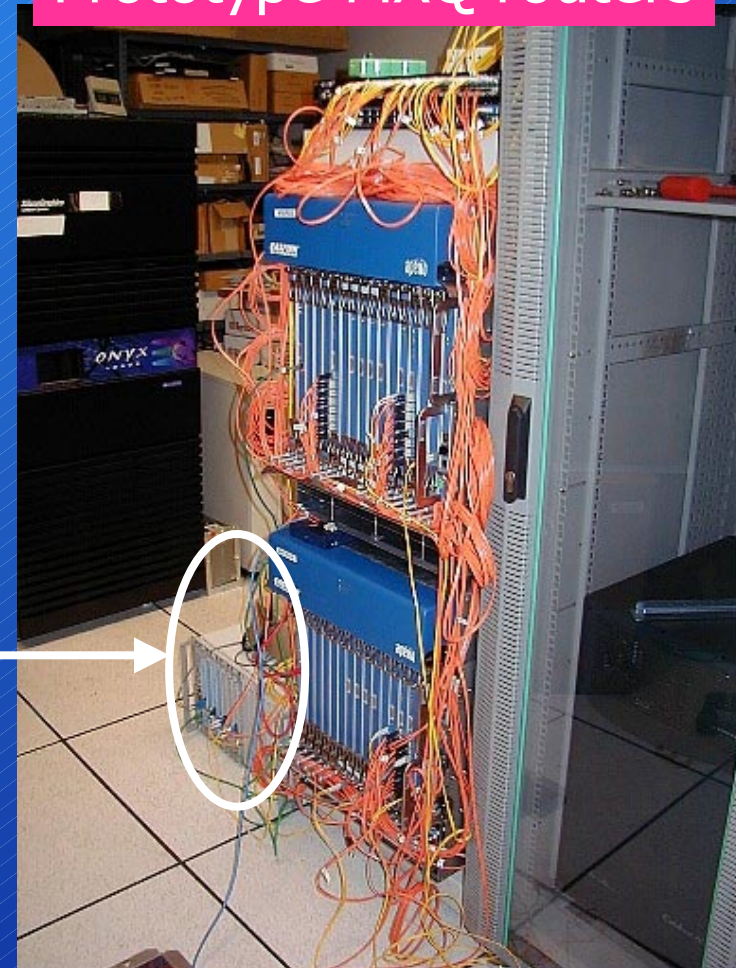


MXQ Routers and Background Traffic Generator

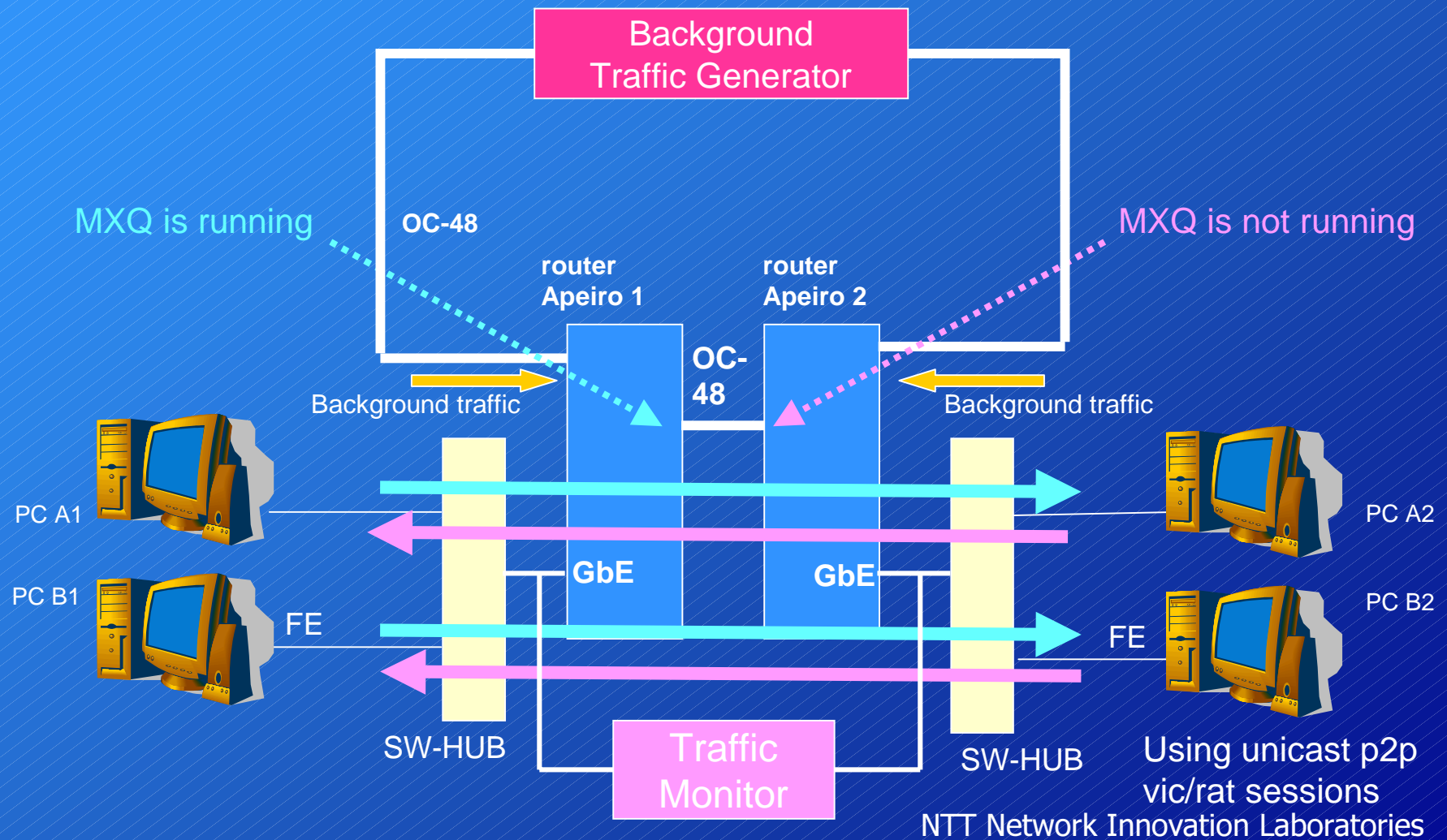
Background Traffic Generator



Prototype MXQ routers



Experimental Network



Network condition of experiment

- Vic sent 3.0Mbps of maximum flow each other
 - Varied according to dynamics of video source information
- Rat sent 512Kbps of flow each other
- Background Traffic Generator sent 2400 of 1Mbps UDP flow (i.e. 2.4Gbps in total) bi-directional
- Maximum load was 100.14%
- MXQ utilization was set to 90%

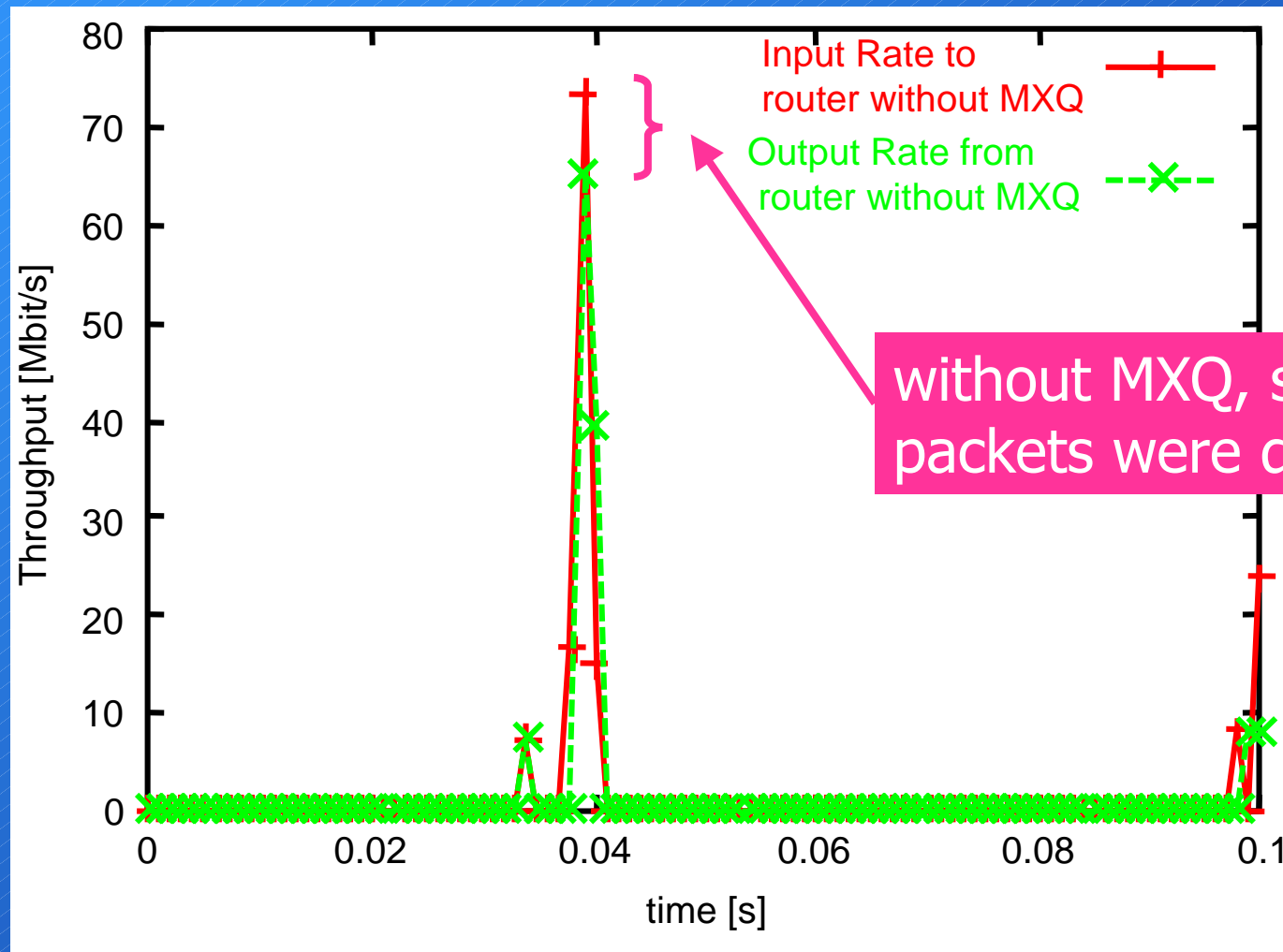
Capturing traffic

- Using “Application Traffic Monitor”
 - It can observe traffic rate on wire with 1ms resolution
- Using optical couplers to split observed traffic
- We captured traffics for 1minutes and wrote them into files.
- We plotted data for 0.1sec in the middle of 1 minutes.

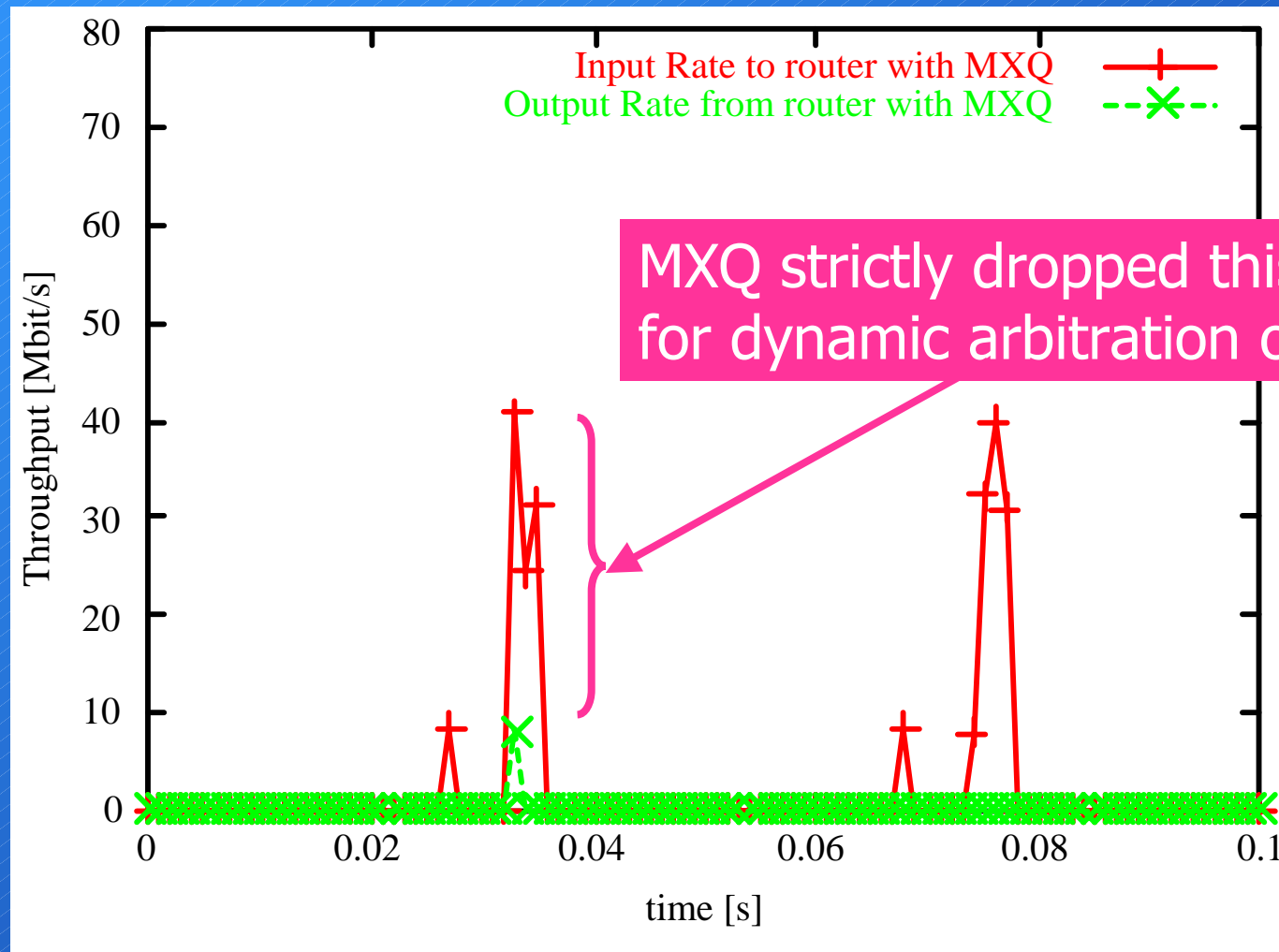


“IP Network Analyzer” (MD-1231A) with option
“Application Traffic Monitor” (MD-1231A-20)
Anritsu Corp.

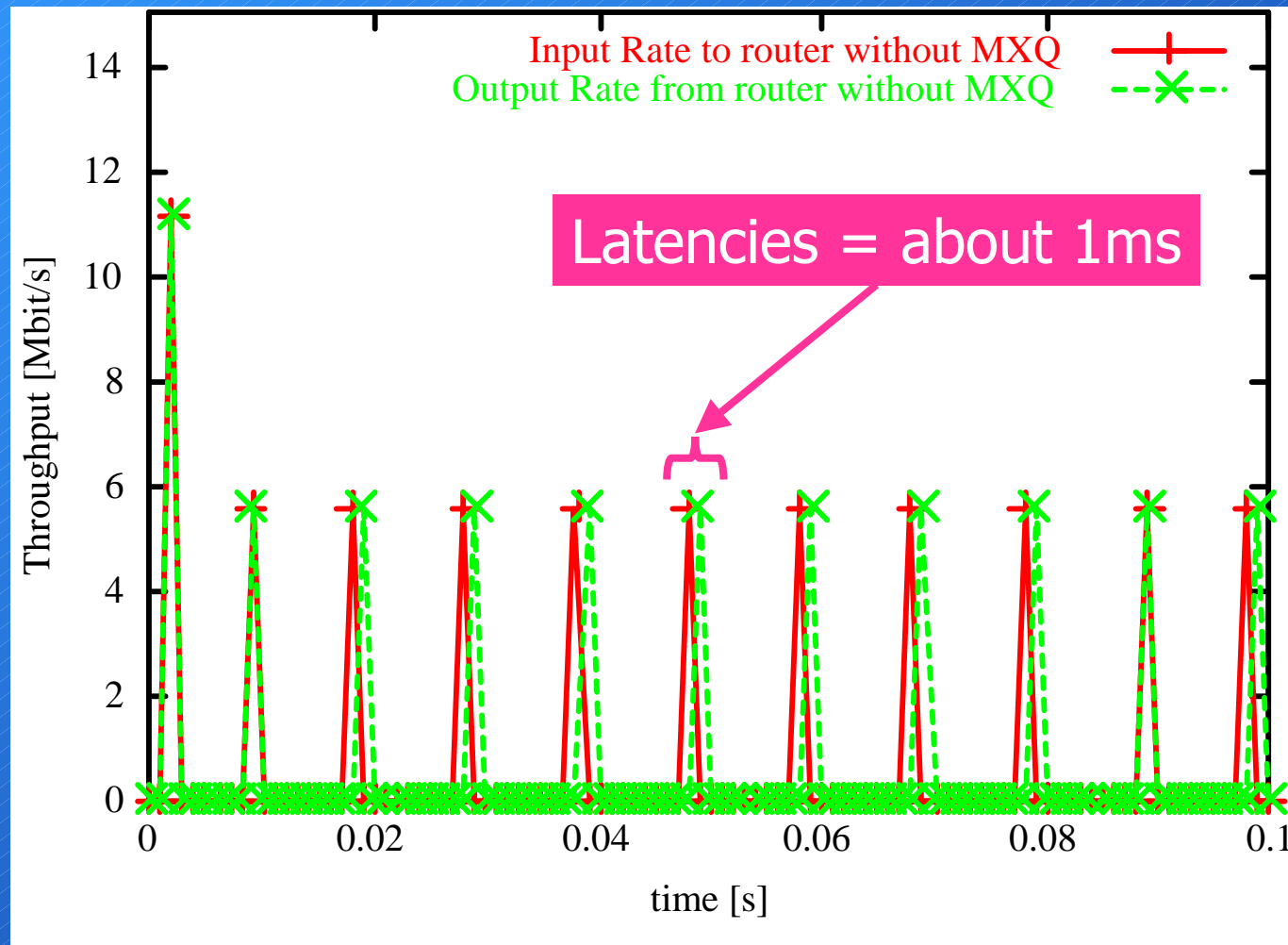
Vic input/output rate without MXQ



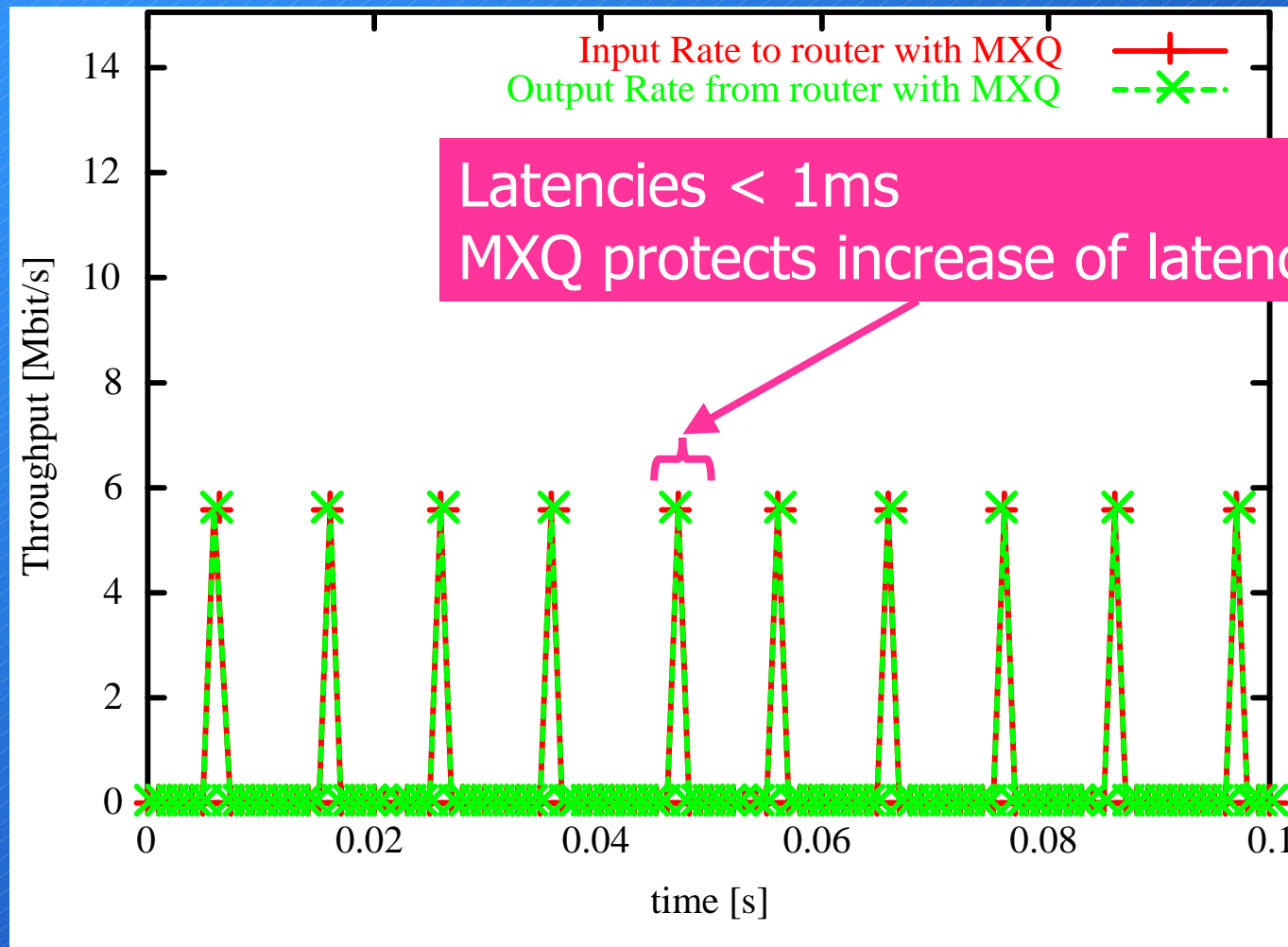
Vic input/output rate with MXQ



Rat input/output rate without MXQ

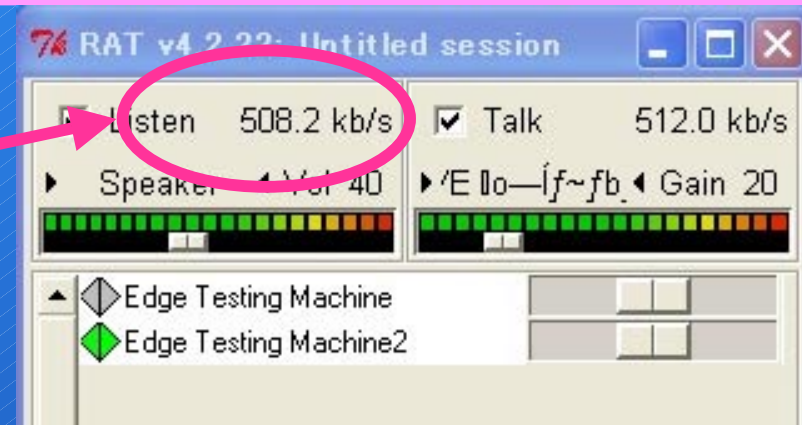


Rat input/output rate with MXQ



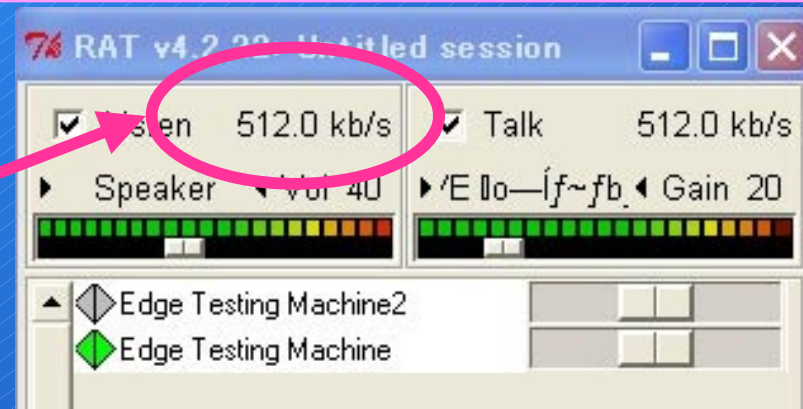
Vic and Rat UI without MXQ

DROPPED !



Vic and Rat UI with MXQ

PROTECTED !
MXQ protects
smaller audio flows



Strictly
Dropped

Conclusion

- We implemented prototype MXQ mechanism on a router
- Results of evaluation shows
 - Protecting smaller audio flows
 - Protecting increase of latencies of audio flows
 - Arbitrating Video Flows depending on their sending rate
- MXQ can apply:
 - Rich Media Interactive Applications
 - AccessGrid Bridge Connection
 - Video Conferencing

Thanks to...

- ON*Vector Project
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- Caspian Networks
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- Anritsu Company
 - Mr. David Torrain
- Access Grid Project
- And you all...